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A  
PRACTICAL TREATISE  
ON  
PHOTOGRAPHY,  
UPON  
PAPER AND GLASS.

BY  
GUSTAVE LE GRAY,

PAINTER AND PHOTOGRAPHER, PARIS.

TRANSLATED BY THOMAS COUSINS,

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## PREFACE.

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*The Translator of this treatise into English, has himself had several years' study and practice of this art, both upon silver tablets, and upon paper ; and being resident in Paris during the time of this translation, had the opportunity of obtaining from the Author, personally, information upon many ambiguous passages,—at the same time inspecting the apparatus, following the process, and examining some hundred specimens produced by this improved method.*

*The Publishers, in submitting this Translation to the notice of English Photographers and the Public, beg to state that they have thought it best to print it without abridgement, excepting a few unimportant passages.*

*In connexion with the Translator, they feel confident that although some parts may be known to English Photographers, yet at the same time there is much novel, useful, and practical information, that they trust will be the means of advancing this elegant art throughout the world.*

Messrs. T. & R. WILLATS beg also respectfully to acquaint their friends and the public, that the publication of this Translation will not interfere with their announced FOURTH EDITION of "WILLATS'S SCIENTIFIC MANUAL, No. I.:—Plain Directions for obtaining Photographic Pictures on Glass or Paper, by the Calotype, Erythrytype, and other processes, including the Chrysotype, Cyanotype, Catalasisotype, Chromotype, Fluorotype," &c., &c., which will contain a condensed and practical account of many valuable discoveries and improvements in Photography on Glass and Paper.



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INTRODUCTION.

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THE extensive application that I have been enabled to make for several years of the art of Photography, as a means of obtaining an exact re-production of nature in all its aspects, Landscapes, Monuments, Pictures, &c., has opened to view its immense importance, and urges the necessity of a sure method, without restriction, which will facilitate its employment by the Artist and Amateur.

I wish to be useful, both to one and the other, in the publication of this process, which my research and experience has made known to me as the most certain and practicable.

The future and extensive application of this art will, doubtless, be confined to the paper process, and I cannot too much engage the amateur to direct his attention and study to it.

The negative proof upon glass, it is true, is finer, but I think it is a false road, and it would be much more desirable to arrive at the same results, with the negative on paper.

Glass is very difficult to prepare, fragile, and inconvenient to travel with, and less rapidly operated upon by the light.

Thus, though its results are extremely delicate, I would strenuously urge the perfection of paper fabrication, as a means to arrive at the same delicacy of detail which is produced upon glass.

That this is possible, I am certain, from some perfect results that I have obtained.

Nevertheless, by the application of a coat of albumen on paper, we can obtain results which are equally perfect with those upon glass.

All will agree that paper is more convenient for travelling, as glass is weighty, fragile, and, if broken, may be difficult to procure in some places.

It is for this reason that I would wish Artists not to be dazzled by the beautiful results upon glass, and not to be discouraged in their pursuits upon paper. It should be, on the contrary, a subject of emulation to perfect the results upon that material.



## PART I.

### Preparation of Negatives on Paper.

#### CHOICE OF NEGATIVE PAPER.

For firmness of grain and solidity, I prefer Whatman's English paper, slightly glazed, of weight from twelve to twenty-four pounds per ream; for Portraiture use the thin, and for Landscape the thick.

#### PREPARATION OF THE NEGATIVE PAPER.

##### *First Operation.*

Dissolve twenty grammes of isinglass in one litre of distilled water (for this purpose use a water bath). *308 gms*  
*1 Litre = 15406.51 gr*

Take 365 grammes of this preparation while warm, and add to it as under:

Iodide of Potassium	.	.	.	13 grammes	<i>0.33</i>
Bromide of ditto	.	.	.	4 „	<i>2.1.2</i>
Chloride of Sodium	.	.	.	2 „	<i>5623</i>

Let this mixture be well dissolved, then filter it through a piece of linen, put the solution, still warm, in a large dish, and plunge in your paper completely, leaf by leaf, one on the other, taking care to prevent the air-bubbles from adhering to the paper.

Put about twenty leaves at a time into the dish, then turn the whole, those at the top to the bottom, then take them out one by one and hang them by one corner with a pin bent like the letter **S** to dry spontaneously.

When hung up, attach to the opposite corner a piece of bibulous paper, which will facilitate the drying.

When the paper is dry, cut it the size required, and preserve it in a folio for use; this paper may be made in the day time, as it is not sensitive to light.

The bromide does not, in this case, act as an accelerator, as it does on the silver plates of the Daguerreotype, because, instead of quickening, it retards the operation a little; its action is to preserve from the gallic acid the white of the paper, which would blacken more rapidly if you employed the iodide of potassium alone.

The great proportion of bromide which I employ, and which might be still increased, permits me to let the image develope itself by the gallic acid a much longer time without spotting, and thus gives a very strong proof of the model. The chloride of sodium gives more intensity to the picture.

The liquid which remains may be put into a well stoppered bottle, and used again if filtered and warmed. To abridge, I call this paper **NEGATIVE PAPER.**

I obtain also a good paper by using spirits of wine instead of water, in the same proportion of weight, and saturating it with collodion instead of isinglass; the salts dissolve perfectly, the paper takes a better consistency, is more rapid by one third, and gives, I think, a superior delicacy to that obtained even by the Albumen process to be mentioned hereafter.

## THE METHOD OF GIVING SENSITIVENESS TO THE NEGATIVE PAPER.

### *Second Operation.*

Prepare, by the light of a taper, the following solution in a stoppered bottle: — distilled water, 140 grammes, crystallized nitrate of silver, 16 grammes.

When the nitrate is dissolved, add 35 grammes of crystallizable acetic acid; be careful to exclude this bottle from the light by covering it with black paper. This solution will keep good until the whole is used.

When you wish to operate, pour the solution upon a porcelain or glass slab, surrounded with a glass or paper border to keep the liquid from running off. I usually take the solution out of the bottle by means of a pipette, so as to prevent the distribution of any pellicle of dust or other impurity from being distributed over the glass slab.

Take a sheet of the iodized paper by two of the corners, holding them perpendicularly, and gently lower the middle of the paper upon the centre of the slab, gradually depress until the sheet is equally spread; repeat this operation several times until the air-bubbles disappear; take also the precaution to keep the upper side of the paper dry.

In order to prevent the fingers from spotting the paper, pass a bone paper knife under the corner of the sheet, to lift it from the slab between that and the thumb.



Let the sheet remain upon the slab until the formation of the chloro-bromo-iodide of silver is perfect.

This may be known by the disappearance of the violet colour, which the back of the paper at first presented ; it must not be left longer, otherwise it would lose its sensitiveness.

The time required is from one to five minutes, depending upon the quality of the paper.

Spread upon the glass of the pressure frame of the camera, a piece of common white paper well soaked in water ; upon this place the prepared sheet, the sensitive side upwards.

The paper which you place underneath must be free from spots of iron and other impurities.

It is also necessary to mark the side of the glass which ought to be at the bottom of the camera, and to keep it always inclined in that direction when the papers are applied ; if this precaution is neglected, the liquid collected at the bottom, in falling over the prepared paper, would not fail to produce spots. The paper thus applied to the glass will remain there for an hour without falling off, and can be placed within that time in the camera.

When I am going to take a proof at a distance, I moisten the sheet of lining paper with a thick solution of gum arabic, and can thus preserve for a longer time its humidity and adhesion. I can also in this case make use of two glasses between which the paper is placed, according to the direction of M. Blanquart Evrard, but it is necessary to take great care that the plates of glass are perfectly clean, and to have them re-polished if scratched.

I employ for this purpose, blotting paper to clean them, as well as my plates ; it is much superior to linen, and absorbs liquids and impurities that adhere to it ; I never spare the blotting paper, for I would rather use a leaf too much than be uncertain about the cleanness of my glass.

When the sheet of lining paper adheres well to the glass, it should not be removed, but only moistened afresh with water, after which you may apply another sheet of the sensitive paper.

In preparing several sheets of the sensitive paper at a time, it is not necessary to wash the slab for each sheet, you need only draw over it a piece of white paper, to remove any dust or pellicle formed.

When your operations are finished, you may pour back the acetate of silver into a bottle, and reserve it for another time.

## EXPOSURE IN THE CAMERA.

*Third Operation.*

The time of exposure in the camera can only be ascertained by experience, depending upon the nature of the lens used, and the amount of light upon the object to be copied; with a double achromatic lens, the time is usually, in shade, from twenty seconds to two minutes, and in the sunshine, from two to twelve seconds. With a single achromatic lens and diaphragm the time of exposure varies from forty seconds to five minutes, with a light of moderate intensity.

When the exposure to the light is terminated, the image is but slightly developed, and should be perfected by the following operation, which may be made within one hour after leaving the camera.

## DEVELOPMENT OF THE IMAGE.

*Fourth Operation.*

Make about a pint bottle of saturated solution of gallic acid, having acid in excess, and using distilled water; decant a portion into a smaller bottle for general use, and fill up the other bottle; you will thus always have a clear saturated solution.

Pour upon a slab of glass kept horizontal, a little of this liquid, spreading it equally with a slip of paper, then apply the exposed paper in the same manner as described for the negative paper, being careful to keep the back dry. Watch its development, which is easily observed through the back of the paper; you may leave it thus as long as the back of the image does not begin to spot.

When it is rendered very vigorous, remove it quickly to another clean slab, and well wash it in several waters, occasionally turning it, and gently passing the finger over the back; by this means you remove any crystals of gallic acid which might spot the picture.

The appearance of the image at the end of this process, will enable you to judge if it was exposed in the camera the proper time.

If it becomes a blueish grey all over, the paper has been exposed too long; if the strongest lights in the object, which should be very black in the negative, are not deeper than the half tints, it has still been too long exposed; if, on the contrary, it has been exposed too short a time, the lights are but slightly marked in black.

If the time has been just right, you will obtain a superb proof, which



will present the contrasts of black and white well defined, and very transparent: the first proof will serve to regulate the necessary time for exposing the remainder in the camera.

A good proof should be able to support the action of the gallic acid from 10 to 30 minutes.

I accelerate the operation much by heating the gallic acid: for that purpose I use the following apparatus:—it is composed of a square metallic vessel, filled with water, under which I place a spirit lamp, upon the surface of this vessel I place the slab, and thus the temperature is well equalized, using from  $140^{\circ}$  to  $160^{\circ}$  Fahrenheit.

The image thus obtained, is permanently fixed by the following operation.

### FIXING THE PROOF.

#### *Fifth Operation.*

Make in a bottle the following solution:—Filtered water 800 grammes, 12125.6  
hyposulphite of soda 100 grammes; cover the bottom of a dish with this, 1340.  
and plunge in your negative proof, taking care to avoid air-bubbles; this dissolves the bromo-chloro-iodide of silver, but does not attack the gallo-nitrate of silver, which forms the blacks.

Never put more than one proof at a time in the bath, but you may use it for several proofs one after the other.

If you examine the proof as a transparency after it has remained some time in the bath, you may be tempted to think it is lost, as in some places spots will appear from the iodide of silver not being completely taken away; but if you wait until it is removed, which you will know by the disappearance of the yellow tint, you will be astonished at the whiteness and transparency of the paper, as well as at the beauty of the blacks in the image.

It will require for this, to remain in the bath from half an hour to three quarters; you will then wash it in several waters, and leave it in a basin of clear water for three quarters of an hour; then let it dry spontaneously by hanging it up; the proof is then quite unalterable by light, as there remains nothing more in the paper than the gallo-nitrate of silver, which is black.

I have negatives thus prepared which have already given me from two hundred to three hundred proofs, the last being quite as good as the first. The fixing by means of the bromide of potassium, as hereafter

named, on the contrary, is not so durable, because it does not remove any of the materials used in preparing the paper, but it gives with the nitrate of silver a good proof in the camera, though less sensitive. It may, nevertheless, be of great use in travelling, and when it is required to make several proofs one after the other; because then you avoid touching the hyposulphite in preparing the negative paper, which spots at the least contact with it.

You may thus place the whole of your negative proofs together in this bath.

Water, one litre; Bromide of Potassium, twenty-four grammes.

In taking the proof out of the bath, you must wash it in several waters and dry it; it should be kept in the bath at least three quarters of an hour, but if you leave it in two or three hours, it will not injure it.

After removing it, you may fix immediately with hyposulphite, when you have finished all your proofs; or you may dry and fix them at your leisure; which process succeeds perfectly well, only you must not draw the positive proof before fixing with hyposulphite.

## WAXING THE NEGATIVE PROOF.

### *Sixth Operation.*

When the negative proof is weak, and the paper very transparent, make the positive-proof without waxing it. Take care to put, in this case, a sheet of paper very transparent and waxed, or a sheet of glazed paper between the negative and the sheet of positive paper, which does not affect, in any way, the clearness of the proof, and preserves the negative from contact with the nitrate of silver, which would spot it.

When the negative proof, which I will call at present the cliché, is vigorous and fine, you must imbibe it with virgin wax, which doubles the transparency and strength of the paper, and preserves it, at the same time, from the influence of the nitrate of silver, which may rest free upon the surface of the positive paper.

The operation is performed as follows:—Take a large daguerreotype plate, and place it, the silver side uppermost, horizontally upon a tripod stand, then heat it by moving a spirit lamp underneath, and with the other hand, at the same time, rub upon it a piece of virgin wax, which will melt; when you have a good coat, well melted, put the wrong side



of your cliché upon it, and facilitate the perfect adherence by the aid of a card.

When it is equally imbibed, take it off and place it between several sheets of common white paper, on which you pass an iron moderately hot, to take off the excess of wax. If the iron is too hot, it will spot the proof and give you much trouble to take it out, even by waxing it afresh.

## PREPARATION OF THE POSITIVE PAPER.

### *Seventh Operation.*

Make first a saturated solution of chloride of sodium; of this take three parts by volume (three small glasses for example), and add to it ten parts of filtered water.

Put a small quantity of this solution on a slab; then make another bottle, containing distilled water, one hundred grammes, chrystalized nitrate of silver, twenty-five grammes; pour a small quantity of this on another slab; have stout white paper cut the proper size, and free from spots and other impurities; choose the rough side and mark it with a +; place it on the bath of chloride of sodium, using the method recommended in the second operation, and leave it from two to four minutes; then dry it between several leaves of pink blotting paper, which I prefer to white, as I can see better if any particles of the blotting adhere to it: you take the first sheet prepared, and with a badger brush you rub the prepared side to take off all the superfluous salt which might adhere to it; put the prepared side of this sheet down on the nitrate slab, and leave it while you prepare another on the salt slab; you then finally remove the prepared sheet and hang it by the corner to dry. If you leave the sheet for a short time upon the nitrate slab, you obtain for your picture a reddish brown tint; if, on the contrary, you leave it a long time, you obtain a blackish tint.

This preparation should be made in the dark, or by the light of a taper only; you must take care that the positive paper is very dry before you put the cliché upon it, or it will spoil by spotting with the nitrate of silver.

It is better to prepare this paper in the evening, and use it the next day; if used immediately, well dry it: you must not prepare the paper more than eight days in advance, as time will blacken it, even in the dark, as well as exposure to light.

## PRODUCING THE POSITIVE PROOF.

*Eighth Operation.*

Place the negative cliché upon the lower glass of the pressure frame, put upon it a sheet of the positive paper—the prepared side upon the cliché; then place above that, a sheet of black paper, and the second glass of the frame upon that; shut down the cover which exercises a slight pressure on the glasses to assure that the contact is perfect. I always take care to leave a border outside of the frame, both of the cliché and the positive paper, that I may judge of the action of the light. Expose the frame to the light of the sun in such a way, that the rays will fall perpendicularly upon the proof; you will judge of the progress by the border outside of the frame.

These are the different tints it will successively take;—greyish blue, neutral tint, violet-blue, indigo, black, bistre-black, sepia, yellow-sepia, yellowish red, greenish grey, always more and more powerful.

When you arrive at the colour you desire, you must stop the process: for example, to have the proof of a black tint after fixing with the hyposulphate, you must stop the process at the sepia colour; and the parts which should form the whites, at the greyish blue, in order to repair the loss of colour it sustains by the application of the hypo-bath.

You thus perceive that I cannot fix the precise time for exposure to the light, as it depends upon the intensity of the cliché, and the colour of the proof you wish to obtain.

## FIXING THE POSITIVE PROOF.

*Ninth Operation.*

The positive proof thus obtained is not permanent; you must fix it directly by the following operation:—

Dissolve in a bottle hyposulphite of soda 100 grammes,  
 Filtered water - - - - 800 „

In another bottle dissolve five grammes of nitrate of silver in a glass or two of water; when well dissolved, you add to it saturated solution of chloride of sodium, until the white precipitate ceases to fall; allow it to repose a short time, and then decant the clear liquor, and gather the precipitate of chloride of silver which you dissolve in the other bottle of hypo.; by this means you obtain directly the black tints with the hypo. thus prepared.



The older the hypo. is, the better ; when it gets thick, you must add a fresh solution of hyposulphite alone, without the chloride of silver, the old containing an excess, which it has taken from the proofs already immersed in it. You must not filter it to take away the deposit, but only let it repose in a large bottle, and decant the clear liquid for use, leaving the sediment to be re-dissolved by fresh hypo.

By leaving the proofs a longer or shorter period in the bath, you can obtain all the tints from the red to the black, and clear yellow ; with a little practice, you will be sure to get the tint you desire. You must not leave a proof less than an hour in the bath, for it to be sufficiently fixed, and it can remain three or four days to obtain the sepia and yellow. By heating the hypo. I accelerate the operation, but must not then leave the proof for an instant to itself, as the rapidity of action is so great, that the picture might be completely effaced.

By adding to the preceding hypo-solution 25 grammes of liquid ammonia, I obtain pretty bister tints, and very pure whites ; the English paper is exceedingly good for these tints. 385.16

I obtain also fine velvet-like tints by putting it (when taken out of the hypo.) upon a bath of sel d'or, using one gramme of the salt to one litre of distilled water. 15.4  
16206.3

Fine yellow tints are obtained by placing the proof (if too vigorous) first in a bath of hypo, and then in a bath composed of one litre of water and 50 grammes of hydrochloric acid ; washing it perfectly in water ; liquid ammonia employed in the same quantity as last mentioned, gives remarkably fine tints. 16406  
770

When the proof is the colour you desire, wash it in several waters, and leave it two or three hours in a bason of water, until, touching it with the tongue, you perceive no sweet taste which indicates the presence of hyposulphite of silver ; then dry it by hanging it up, and it is finished. The bath of hypo. may contain as many proofs as you please.

## PART II.

### THE PREPARATION OF NEGATIVES UPON GLASS BY ALBUMEN.

THIS preparation is based upon the property which the albumen has, by the application of heat, to become completely insoluble.

It is to the Nephew of M. Niepce, of St. Victor, that we owe the application of this substance to Photography upon glass. It was he who first continued, in another manner, the experiments on glass made by his uncle, and arrived at satisfactory results. It is to his incessant efforts, and the frankness with which he published his discoveries that we owe the fine proofs obtained in the present day. The negative proofs upon glass are distinguished by a fineness approaching very near to those obtained by the daguerreotype.

For the re-production of engravings, pictures, sculpture, and landscape, the result is complete. The only thing to be still desired, for portraits is an increase in the celerity of the operation.

It is, nevertheless, to be hoped that, with the united concurrence of artists and amateurs who are at present occupied upon this subject, we shall succeed in diminishing the time necessary for exposure to the light.

It is desirable that every one should publish frankly the fruit of his efforts, and there will evidently result immense progress and improvement.

### THE PREPARATION OF THE ALBUMEN FOR THE GLASS.

Take of the white of eggs, very fresh, equal in

2819.35	weight to	.	.	.	183 grammes.
104.84	Then dissolve Iodide of Potassium	.	.	7	„
30.87	Bromide of Potassium	.	.	2	„
15.41	Chloride of Sodium	.	.	1	„

*N.B.—In a private conversation with the author, he advised, as an improvement, the following proportions.—T. C.*

2819.35	White of Eggs	.	.	.	183 grammes.
46.22	Iodide of Potassium	.	.	3	„
15.41	Bromide ditto	.	.	1	„
3.86	Chloride of Sodium	.	.	$\frac{1}{4}$	„



Beat this mixture in a large dish with a wooden fork, until it is reduced to a thick white froth, then let it repose all night; the next day decant the viscous liquid, which has deposited, and use it for the preparation of your glasses.

For this purpose take thin glass, or, what is much better, *ground glass, on which the adherence is more perfect*, cut it the size of your camera frame, and grind the edges.

The success of the proof is, in a great measure, due to the evenness of the coat of albumen.

To obtain this, place one of your glasses horizontally, the unpolished side above (if you use ground glass which I think much preferable), and then pour on it an abundant quantity of the albumen; then with a rule of glass very straight, upon the ends of which fasten two bands of stout paper steeped in virgin wax, and which you hold with the fingers in such a manner that they will overlap the sides of the glass plate about one-eighth of an inch. You then draw the rule over the glass with one sweep, so as to take off the excess of albumen. The object of the slip of paper, is to keep the glass rule from the surface of the plate, and ensure a thin but even coating.

Thus, in making the paper band more or less thick, you vary the thickness of the coating of albumen. Or you may arrive at the same result by pasting two narrow bands of paper on the sides of the plate, and passing simply the rule down. I prefer the first means, because with the second one is almost sure to soil the glass in sticking the paper upon it.

You must never go the second time over the glass with the rule, or you will make air-bubbles; when thus prepared, permit it to dry spontaneously, keeping it in an horizontal position and free from dust. When the coat of albumen is well dry, submit your glasses to the temperature of  $160^{\circ}$  to  $180^{\circ}$  Farenheit; this you may do either before a quick fire, or by shutting them up in an iron saucepan well tinned, with a cover; you then place the saucepan in a bath of boiling water, the action of the heat hardens the albumen, it then becomes perfectly insoluble and ready to receive the action of the aceto-nitrate of silver.

The glasses thus prepared may be kept for any length of time. I prepare the first coat also, by saturating the former mixture with gallic acid, which gives it more consistency and greater sensitiveness.

When you wish to make a proof, (by using the preparation moist,)

you plunge the glass thus prepared in a bath of aceto-nitrate of silver, described in the second operation of the negative paper. This operation is very delicate, because the least stoppage in its immersion in the bath, will operate on the sensitive coating, and cause irregularities which nothing can remedy.

To obtain this instantaneous and regular immersion, I make a box with glass sides, a trifle larger than the plate and about half an inch wide, with wooden grooves, similar to those in the daguerreotype plate box ; into this I pour the aceto-nitrate, and let the prepared glass fall into it with a single movement, leaving it to soak four or five minutes in the bath ; then remove it, wash well with distilled water and expose it immediately in the camera while moist ; a time which will vary from two to thirty minutes, and nearly double that time if the glass is dry ; the time of exposure depending upon the nature of the object to be copied, and its position with regard to the light.

When you wish to operate with the glasses dry instead of moist, it is good to dip them in a bath of gallic acid a quarter of an hour after they are taken out of the aceto-nitrate bath ; then well wash them with distilled water and dry them as directed.

When you take the plate out of the camera, you develop the image the same as the negative on paper, by putting it into a bath of saturated gallic acid ; when it is well-developed, fix it by the same method indicated previously for the paper.

To obtain a positive proof, it is sufficient to apply on the negative proof a sheet of common positive paper, (or, better still, a sheet of positive albumen paper, which I will describe hereafter.

You then put it in the pressure frame, placing above it a piece of black cloth pasted on one side of a thick sheet of glass ; then shut the frame, giving to the proof a slight pressure ; after which, expose it to the light. In order to follow its action, you may just raise it by one corner of the glass, to judge of the tint which the image takes ; when you think it sufficiently exposed, take it out of the frame and fix it the same as the positive paper.

#### PREPARATION OF ALBUMEN PAPER FOR THE NEGATIVE PROOF.

The same preparation of albumen and the same quantities apply also perfectly upon paper, but it requires great caution to have it equal.



The proof that is thus furnished is remarkable for the depth of its blacks and transparency of its lights; almost all papers, when they are not too much spotted with black points, will serve by this method and give good results.

I obtain also a delicacy of execution which is almost as well defined as the proofs on glass, and which is incontestibly more artistic. Pour the solution into a dish, placed horizontally, taking care that there is no froth; then take the paper that you have chosen, and wet it on one side only, beginning at the edge of the dish which is nearest to you, and the largest side of the sheet, placing the right angle on the liquid, and inclining it towards you; advance it in such a manner as to exercise a pressure which will remove the air-bubbles. Place before you a light so as to be able to perceive the bubbles and to push them out if they remain.

Let the leaf imbibe for a minute at most, without touching it; then take it up gently, but at once, with a very regular movement, and hang it up by the corner to dry.

You prepare thus as many leaves as you wish in the same bath, taking care that there is always about a quarter of an inch in depth of the solution in the dish; then place your sheets (thus prepared and dried) one on the other between two leaves of white paper, and pass over them several times a very hot iron, taking out a leaf each time; you will thus render the albumen insoluble.

The iron should be as hot as it can be without scorching the paper.

Then make use of this negative paper exactly like the first paper named, only great attention must be observed that the immersion in the aceto-nitrate bath is instantaneous, and that the air-bubbles are immediately driven out; for every time you stop, you will make stains the same as on glass. It is also necessary to heat moderately the gallic acid.

One of the best services rendered by the albumen to photography is, without doubt, its application to the preparation of the positive paper, to which it gives a brilliancy and vigour difficult to obtain by any other method.

#### PREPARATION OF ALBUMEN POSITIVE PAPER.

Take white of eggs, to which add the fifth part by volume of saturated solution of chloride of sodium; then beat it into a froth, and decant the clear liquid after it has settled for one night.

Pour out the liquid into a basin, and prepare your positive paper

on one side only, by the same method as in the preceding chapter for negative paper; dry it and pass the hot iron over it in the same manner as directed.

You may keep this paper some time before you apply the nitrate of silver to it, as it does not spoil.

If you use it directly, put the albumen side on a bath of nitrate of silver, containing one part of nitrate by weight, to four of distilled water, and let it imbibe four or five minutes; then hang it by the corner to dry, and finish it as I have already described in the first positive paper.

This paper gives much depth to the blacks, and great brilliancy to the whites. In leaving it a shorter time on the nitrate bath, (about one minute,) and using Whatman's paper, you may obtain a reddish purple tint very harmonious.

## OBSERVATIONS RELATIVE TO OBTAINING VIEWS.

When you desire to take a view, be careful not to make the image too large, and that your perpendicular lines are true.

The distance from the object to be copied should be about one quarter of the whole scene, if you would obtain a picture free from any distortion.

When you wish to take the whole scene with a single lens, it is better to employ the half-plate size.

It is also well to get conveniently near to the object to be copied, as it requires a longer time in the camera when the distance is great: vegetation and other green objects generally require a longer exposure.

Care must be taken that the sun's rays do not strike upon the object glass of the camera when taking a view, as it would interfere with the clearness of the image.

When you wish to operate in the country, it is quite necessary to take with you every thing you may require for use.

The following list of articles compose my travelling apparatus:

### *Camera and Lens.*

In the interior of the Camera I enclose five bottles containing solutions as under:

Aceto-nitrate of silver, saturated solution of gallic acid, distilled water, hyposulphite of soda, one pipette, three funnels (one in the other),



three very shallow basins of porcelain, sunk in a box of walnut wood, and covered with ground glass, so contrived as to keep it air tight.

In one basin I place my lining paper already wetted.

In the second I have my negative proofs in the solution of bromide. In the other I have water in which to place my proofs when sufficiently fixed, and leave them until I return home to finish with the hyposulphite of soda.

There should be only sufficient liquid in the basin to permit the leaves to adhere to the bottom, and no more, as they might be injured by slipping about in the journey.

I take also two glass slabs, one for the aceto-nitrate, and the other for the gallic acid. A tripod to keep the basons level, a portfolio containing the prepared paper, two or three quires of blotting paper to clean the slabs. A tripod stand to place the camera upon, also a stout black cloth, sufficiently large to cover completely the machine, and so arranged as to form a kind of tent, under which to make all my preparations; in case of wind, I fix the cloth to the ground with pegs. In one side of the tent I have an opening a foot square, covered with yellow stuff, which permits sufficient light to enable me to conduct the various operations. The box which contains the apparatus serves me for a table.

#### *List of Chemicals necessary:*

Iodide of Potassium	Liquid Ammonia
Bromide of Potassium	Hydrochloric Acid
Chloride of Sodium	Collodion
Crystalized Nitrate of Silver	Spirit of Wine
Crystalizable Acetic Acid	Distilled Water
Crystalized Gallic Acid	Cyanide of Potassium
Hyposulphite of Soda	

N.B. The cyanide of potassium is a very active poison, and should be employed with great caution; you may use it to remove stains made on the hands by the nitrate of silver, using about one gramme of the salt to ten of water, especially guard against chaps or cuts in the flesh.

#### THE LENS, OR OBJECTIVE.

The choice of a good lens is of the utmost importance for obtaining fine proofs. For the reproduction of landscapes and monuments, the

single lens is superior, to obtain the whole in good proportion, the focus should be of considerable length.

For portraits, a double achromatic lens is necessary. These lenses give excellent results, but centralize the light a little too much, it is this centralization which causes them to be more rapid in operation than others.

In choosing a lens, select one that gives the image clear to the edges of the ground glass, and do not attach too much importance to its rapidity of action; the image is better when it presents a clear aspect generally, than when it is very clear in the centre, and becomes gradually indistinct towards the edges. It is also necessary to be well assured that the chemical focus coincides with the visible focus.

I have found the French lens of Messrs. Lerebours and Secretan answer perfectly, I use no other kind for my portraits. Those for the half-plate are remarkable for their clearness and rapidity, and I recommend the amateur to purchase one of eight centimeters in diameter, it gives remarkable fine portraits; and by adapting a diaphragm the whole plate may be employed. With a single lens for landscapes and monuments, and a double one for portraits, the amateur will have all that is requisite. If you wish to have the landscape very clear, use the diaphragm.

The above combination I use daily with great success. I have a double French lens for the normal plate, composed of two-glasses of eight centimeters, which serves me for large portraits, and a single lens for monuments. I sometimes add to the first, the single lens, the convex side of the glass towards the interior of the camera; and by this addition I obtain an image on the half-plate excessively luminous, and a very short focus that gives an extraordinary rapidity, producing a portrait in ten seconds in the shade. For this I have a tube of twelve centimeters long, which slides upon the double lens, and at the extremity screw on the single lens, I choose the distance according to the dimension of the picture I wish to obtain, the glasses above named are all that is requisite to operate at will, under any circumstances, successfully.

#### OBSERVATIONS UPON THE EXECUTION OF PORTRAITS, AND THE REPRODUCTION OF DAGUERREOTYPES AND OIL PAINTINGS.

Tasteful effect is one of the most indispensable conditions for an agreeable portrait, and the amateur should neglect nothing to obtain it.



The model ought always to be placed in shade, and one side a little more illuminated than the other. It is great want of elegance to place the head in the same position as the shoulders; if the face is full, the body should be placed three quarters round, and *vice versa*.

The light obtained from a very large window is good for the execution of portraits, care should be taken to place before the window a white screen, to project reflected light upon those parts that are in shade; without this precaution we obtain too sudden a transition from light to dark, which is not harmonious. A mirror so disposed as to convey the reflected rays upon that part of the figure in shade, give also a very beautiful effect. The model should thus be placed between the direct rays from the window, and those reflected by the screen or mirror.

The exterior diffusion of light is good, as it assists the rapidity of action, but in this case it is presented to one side of the model only, leaving the other in very deep shade, and without the assistance of reflected light the effect would be entirely destroyed.

In pointing the Camera be careful to have the face very clearly defined upon the ground glass. When a portrait is taken in a sitting posture, the knees and the hands are generally too forward to be in focus with the face; to overcome this difficulty, I have the slate that holds the plate at the back of the camera curved. To obtain this curve I place a person in a chair, the hands and knees in the most habitual position, then calculate, upon the ground glass, the difference in length of focus between the hands and face; this difference being established, I make the curve of the plate to correspond with the place of the image. The place occupied by the head should be scrupulously the same as upon the ground glass, and the curve arranged only for the part out of focus. I have found the proof come out perfectly clear in all points by adopting this method. A dark drapery should also be placed before the model to repose the eyes upon, as it is less fatiguing to the sight than light colours; place a spot on that part upon which the eyes are to rest, requiring the lids to be kept in the most habitual position. The eye should not be fixed with intense regard upon the spot, but with a degree of freedom, otherwise it will become suffused with tears, and by the effect of nervous contraction the portrait will become distorted.

I have met with much success in copying daguerreotype impressions upon paper; for this purpose, I adapt my single lens to a camera, from fifty centimetres to one metre of focal length, then cover the front of the

camera and lens with black cloth, leaving only an opening the size of the diaphragm ; by this means, remarkable intensity in the blacks of the proof may be obtained, and the reflection of the camera in the plate be avoided.

The light should fall upon the plate by oblique rays, and in such a manner that they never reflect at a right angle into the camera.

The image may thus be obtained equal to, or double and treble the size of the plate to be copied.

The same precaution should be taken in oil paintings.

To copy a plate the same size or larger requires a much longer exposure in the camera, from a quarter to half an hour, according to the size.

I have endeavoured to give, in this little treatise, all I considered would be useful to the amateur for the success of his pursuits ; discouragement must not follow from the want of success at first, observe exactly all the directions given, difficulties will be surmounted and success certain. Every day I am practically engaged in this art at my Photographic Rooms, No. 7, Chemin de Ronde de la Barrier Cliche, and shall be most happy to give, personally, any further information or assistance, and to exhibit my extensive collection of specimens produced by this process.

## APPENDIX.

I HAVE just discovered a process upon glass, by Hydrofluoric-ether, the Fluoride of Potassium and Soda dissolved in alcohol 40°, mixed with sulphuric ether, and afterwards saturated with collodion ; I afterwards re-act with aceto-nitrate of silver, and thus obtain proofs in the camera in five seconds in shade. I develop the image by a very weak solution of sulphate of iron, and fix with hyposulphite of soda. I hope, by this process, to arrive at great rapidity. Ammonia and Bromide of Potassium give great variations of promptitude. As soon as my experiments are complete, I will publish the result in an Appendix. This application upon glass is very easy. The same agents employed with Albumen and Dextrine, give also excellent results, and very quick.

I have also experimented with a mucilage produced by a fucus, a kind of sea weed, which promises future success. I hope, by some of these means, to succeed in taking portraits in three or four seconds.



\*COMPARATIVE TABLE OF ENGLISH AND FRENCH  
WEIGHTS AND MEASURES.

			Grains
1 Pound Avoirdupois	.	.	7000
1 Ounce ditto	.	.	437.5
1 Pound Troy	.	.	5760
1 Ounce ditto	.	.	480

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Gramme	.	.	15.4063
Decigramme	.	.	1.5406
Centigramme	.	.	0.1540
Milligramme	.	.	0.0154

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			Inches
Yard	.	.	36
Metre	.	.	39.37079
Decimetre	.	.	3.93708
Centimetre	.	.	0.39370
Millimetre	.	.	0.03937

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		Cubic Inches.	Grains of Distilled Water.
Imperial Gallon	.	277.274	70000
Ditto Pint	.	34.65925	8750
Ditto Ounce	.	1.7329625	437.5
Cubic Inch	.	1.	252.458
Litre	.	61.02525	15406.312
Decilitre	.	6.10252	1540.631

\*These Tables are copied from Faraday's Chemical Manipulation.

# CATALOGUE

OF

## PHOTOGRAPHIC APPARATUS,

### CHEMICAL PREPARATIONS & MATERIALS,

MANUFACTURED AND SOLD BY

**THOS. & RICH<sup>d</sup>. WILLATS,**  
**OPTICIANS AND PHILOSOPHICAL INSTRUMENT**  
**MAKERS,**

**28, IRONMONGER LANE,**

REMOVED FROM 98, CHEAPSIDE, LONDON.

	£	s.	d.
Improved French Pattern Shifting Back Camera, with achromatic lens, 3 in. in diameter, mounted in brass sliding tube, with diaphragms to take pictures 10 by 8 in. . . . .	10	0	0
Ditto ditto with rackwork adjustment and double slide to hold two prepared papers . . . . .	11	0	0
Ditto ditto with Lerebour's Triple Combination Lenses to take Pictures $8\frac{1}{2}$ by $6\frac{1}{2}$ in. or whole plate . . . . .	14	14	0
Ditto ditto with double combination lenses with diaphragms to take $6\frac{1}{2}$ by $4\frac{3}{4}$ in. . . . .	10	10	0
Ditto ditto with double combination lenses to take pictures 4 by 3 in. . . . .	5	16	0
Ditto ditto with single achromatic lens, rackwork adjustment to take pictures 6 by 7 in. . . . .	5	0	0
Ditto ditto with single Achromatic lens to take pictures 5 by 4 in. . . . .	2	10	0
Photographic Camera, with brass sliding front and miniscus lens for obtaining pictures on paper, 4 by 4 in. . . . .	1	1	0
Ditto ditto with sliding brass front and achromatic lens . . . . .	1	5	6
Ditto ditto of best construction, with rackwork adjustment, and achromatic lens . . . . .	2	2	0
fig. 1, from £1 15s., to			



				£	s.	d.
Complete sets of Photographic Apparatus, including chemicals and apparatus for paper or glass, in case, to take pictures						
4 by 4 in.	.	.	.	3	3	0
Ditto	ditto	to take pictures 5 by 4 in.	.	5	5	0
Ditto	ditto	to take pictures 6 by 7 in.	.	8	8	0
Portable Folding Cameras	.	.	.	from 4	4	0

## Copying Frames, &c.

Copying Frames and Glass for obtaining positive Photographs						
				from	0	5 6
Ditto	ditto	with padded backboard and pressure bars		from	0	7 6
Ditto	ditto	with sliding lid for ditto	fig. 40		0	10 6
Improved ditto, with hinged back	.	fig. 41	from	1	1	0
Tin vessels for heating Photographic Drawings	fig. 42	3s. &		0	5	0
Porcelain Pans for washing and setting pictures	.	1s. 6d. &		0	2	6
Extra large ditto, 12 by 10 inches	.	.		0	4	6
Camera Stands	fig. 18, 19, 20, 21.	16s., 21s., 37s. 6d. &		2	2	0
Head Rests	.	.	.	0	7	6
Improved Camel's Hair Brushes prepared expressly for Photo-						
graphic purposes						
	.	.	.	round	0	1 0
Ditto	ditto	.	.	flat	0	1 6
Ditto	ditto	larger sizes	.	2s. 6d. &	0	3 6
Turner's superior Paper, made expressly for Photographic						
purposes						
	.	.	.	per quire folio	0	4 0
Ditto	ditto	.	.	quarto	0	2 0
Whatman's Turkey Mill (selected)	.	.	.	per quire	0	2 0
White Wove Blotting Paper	.	.	.	.	0	1 6
Pink ditto	ditto	.	.	.	0	2 0
Plate Glass Slabs of various sizes	.	.	.	1s., 2s., 3s. &	0	5 0
Glass Spirit Lamps.	.	.	.	2s. 6d., 3s. 6d. &	0	5 0
Tripod Stands, or Levelling Stands	fig. 22, 23.	5s., 6s. &		0	10	6
Virgin Wax	.	.	.	per oz.	0	0 4
Flat Glass Cells	.	.	.	from	0	2 6
Portable Still, with worm and tub for the distillation of water						
on common fire						
	.	.	.	1 gallon	1	1 0
Ditto ditto, best make	.	.	.	.	1	5 0
Ditto ditto, best make	.	.	.	2 gallons	2	0 0

	£	s.	d.
Thermometers . . . . .	from	0	2 6
Retort and Receiver Stands, glass retorts, receivers and flasks, &c.			
Glass Funnels and Stirring Rods . . . . .			
Graduated Glass Measures . . . . .			
Mortars and Pestles . . . . .			
Scales and Weights, common . . . . .		0	3 6
Ditto ditto, glass pans, best . . . . .		0	18 0
Pipettes . . . . .	6d. and	0	0 8
Superfine White Swiss Glass for Negative Photographs of various sizes			

## Pure Chemicals,

FOR PHOTOGRAPHIC PROCESSES ON PAPER OR GLASS.

Acid Acetic, crystallisable . . . . .	per oz.	0	1	0
— Gallic, pure . . . . .	„	0	5	0
— Succinnic, pure . . . . .	„	0	4	6
— Hydrochloric, pure . . . . .	„	0	0	2
Ammonia Solution . . . . .	per oz. 2d. and	0	0	3
Collodion . . . . .	per bott.	0	2	6
Baryta Hydrochlorate . . . . .	per oz.	0	0	6
Salt of Gold or Sel D'or . . . . .	ber bott.	0	5	0
Iron Sulphate, pure . . . . .	„	0	0	2
Syrup of the Iodide Iron . . . . .	„	0	1	6
Lime Chloride, pure . . . . .	„	0	0	6
Potassium Bromide, Pure . . . . .	„	0	5	0
— Cyanide, fused . . . . .	„	0	1	0
— Pure . . . . .	„	0	3	6
— Iodide, Pure . . . . .	„	0	3	0
Silver Nitrate Pure, crystalised . . . . .	„	0	5	6
Soda Hyposulphite . . . . .	per lb.	0	3	0
— — — — — . . . . .	per oz.	0	0	3
Distilled Water . . . . .	per gall	0	1	0
Pure Gelatine . . . . .		0	0	6
Dextrine . . . . .		0	0	6

The above prices for Chemicals are subject to constant variation. The figures above refer to Willats's Photographic Catalogue.

*For further particulars of Daguerreotype and Photographic Apparatus, see Willats's Illustrated Catalogue, Part 1, Photography, price Fourpence, by Post.*